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IS 14762 (1999): Fishing Vessels - Selection of Propeller Shafts for Mechanized Fishing Boats - Guidelines [TED 18: Inland, Harbour Crafts and Fishing Vessels]



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भारतीय मानक

(Reaffirmed 2005)

मछली पकड़ने के जलपोत — मशीन चालित मछली पकड़ने
की नौकाओं के लिए नोडक शेफ्ट का चुनाव —
मार्गदर्शी सिद्धांत

Indian Standard

FISHING VESSELS — SELECTION OF
PROPELLER SHAFTS FOR MECHANIZED
FISHING BOATS — GUIDELINES

ICS 47.020.20

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fishing Vessels Sectional Committee had been approved by the Transport Engineering Division Council.

Proper matching of engine, propeller and propeller shaft is very important for operational efficiency of mechanised fishing boats. The objective of this Standard is to provide guidelines for proper selection of propeller shafts taking into account all the relevant parameters.

For the purpose of deciding whether a particular requirements of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FISHING VESSELS — SELECTION OF PROPELLER SHAFTS FOR MECHANIZED FISHING BOATS — GUIDELINES

1 SCOPE

This standard gives guidelines for selection of propeller shaft diameter and length in relation to engine power and boat sizes.

2 REFERENCES

2.1 The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
4431 : 1978	Specification for carbon and carbon — Manganese free-cutting steels (<i>first revision</i>)
6603 : 1999	Stainless steel bars and flats — Specification (<i>first revision</i>)
7411 (Part 1) : 1974	Ships' intermediate shafts (integral flange) : Part 1 For port crafts

3 MATERIALS

The material of shaft shall conform to either of the following :

<i>IS No.</i>	<i>Requirement</i>
4431	Grade 14C14S14
6603	Grade X04Cr17Ni12Mo2Ti

4 FACTORS AFFECTING SELECTION OF PROPELLER SHAFTS

4.1 Intermediate Shaft

Intermediate shaft size is the basic consideration for arriving at main propeller shaft size. Normally, intermediate shaft size is lesser in diameter than propeller shaft diameter. The intermediate shaft shall conform to IS 7411 (Part 1).

4.2 Boat Size and Type

From the boat size and type of fishing operation to be carried out, the power requirement for the boat is estimated. For guidance purposes, approximate power requirements for different boat sizes used for fishing operations are given in Table 1.

4.3 Engine Power

4.3.1 Once the power requirement for the boat is estimated the shaft size can be found out as:

$$d_{ts} = 100 \times k \times 3 \sqrt{\frac{(P \times 560)}{[R \times (\sigma u + 160)]}}$$

d_{ts} = minimum required dia in mm.

For intermediate shaft:

- k = 1.0 for integral coupling, and
- k = 1.10 for coupling connected to shaft with key

For tail shaft :

- k = 1.26 for a shaft carrying a keyed propeller and where the shaft is fitted with a continuous liner for protection from corrosion or is oil lubricated and fitted with an effective oil sealing gland, and
- k = 1.29 for a shaft carrying a keyed propeller and is fitted with water lubricated bearings with shaft being unprotected from corrosion.

P = maximum shaft power in kW.

R = revolutions per minutes corresponding to the maximum shaft power giving maximum torque.

σu = specified minimum strength of the material in N/mm².

4.3.2 Span of bearing in the stern tube for the propeller shaft and span of supporting bearings required for an intermediate shaft is to be determined depending on the slenderness, material and size of the propeller shaft. As a general guideline, the maximum span of bearings be 30 times the diameter of propeller/intermediate shaft.

4.4 Couplings

4.4.1 The minimum thickness of the coupling flanges are to be equal to the diameters on the coupling bolts at face of the couplings and for this purpose the minimum tensile strength of the bolts is to be taken as equivalent to that of the shafts. However, for intermediate and thrust shafts, the thickness of the

Table 1 Power Requirements and Boat Sizes
(Clause 4.2)

Sl No.	Boat Size and Type	Construction Material	Displacement tons	Approximately Speed, knots	Power Requirements, kW, Min
(1)	(2)	(3)	(4)	(5)	(6)
i)	7.3 m (24 ft) long OAL multipurpose fishing boat	FRP	1.3	7	7.5
ii)	7.6 m (25 ft) open boat	do	2.8	7	11.2
iii)	9.1 m (30 ft) Gill Netter	do	7.0	8 to 9	26.0
iv)	9.8 m (32 ft) Trawler	do	7.5	8 to 9	33.6
v)	11.0 m (36 ft) Shrimp Trawler	do	12.2	8 to 9	44.8
vi)	11.6 m (38 ft) Multipurpose Fishing Boat	do	14.4	8 to 9	44.8
vii)	12.2 m (40 ft) Gill Netter/Trawler	do	15.0	8 to 9	59.7
viii)	12.8 m (42 ft) Multipurpose Fishing Boat	do	22.3	8 to 9	74.6
ix)	15.0 m (49 ft) Drifter Trawler	do	30.0	10	167.8
x)	15.2 m (50 ft) Trawler	do	32.0	10	167.8
xi)	17.05 m (56 ft) Tuna Long Liners	Steel	60.0	12	261.1
xii)	31.5 m (103 ft) Tuna Long Liners	do	312.6	12	484.9
xiii)	35.76 m (117 ft) Tuna Long Liners	do	464.6	13	596.8

coupling flange is in no case to be less than 0.20 of the diameter of the intermediate shaft. Similarly, the thickness of the inboard screw-shaft coupling flange is to be not less than 0.20 of the diameter of the screw-shaft.

4.4.2 The fillet radius at the base of the coupling flange is to be not less than 0.08 of the diameter of the shaft at the coupling but in the case of crankshafts, the fillet radius at the centre coupling flanges may be 0.05 of the diameter of the shaft at the coupling. The fillets are to have a smooth finish and are not to be recessed in way of nut and bolt heads.

4.4.3 Where the propeller is attached by means of a flange, the thickness of the flange is to be not less than 0.25 of the actual diameter of the adjacent part of the screw-shaft. The fillet radius at the base of the coupling flange is to be not less than 0.125 of the diameter of the shaft at the coupling.

4.4.4 Where couplings are separate from the shafts, provision is to be made to resist the astern pull.

4.4.5 Where a coupling is shrunk on to the parallel portion of a shaft or is mounted on a slight taper, for example by means of the oil pressure injection method, full particulars of the coupling including the interference fit are to be submitted for special consideration of the statutory authorities.

4.5 General

4.5.1 It is important to take every care while installing the marine engine in the boat and align the propeller shaft with marine gearbox output shaft.

4.5.2 However, individual shaft size requirement is to be worked out based on the information of engine HP, RPM, reduction ratio of gearbox, propeller thrust length, type of duty and economy subject to the condition that these meet the relevant rules and regulations laid down by the Statutory Authorities/ Classification Societies.

5 STERN TUBE ASSEMBLY

Various types of stern tube assembly with different bearings combination and type of lubrication is indicated in Table 2.

Table 2 Stern Tube Assembly Bearings and Lubrication Type

Sl No.	Stern Tube Assembly with Bearings Combination	Type of Lubrication
(1)	(2)	(3)
i)	High tensile manganese bronze shaft with gun metal sleeves with white metal lined bearings and with special seals at aft housing and similar bearing in gland housing	All grease filled stern-tube and provision for grease cup on gland housing or grease gun facility on gland housing
ii)	Stainless steel shaft as specified in 3 and stern tube assembly with cutless rubber bush at aft and wooden or cutless bush in gland housing	Sea water lubrication. Flushing out facility on gland housing. Hand operated flushing gun may be used for flushing out dirt/fine sea sand from stern tube assembly.
iii)	Stainless steel shaft with stern tube assembly with both wooden bushes	Sea water lubrication

NOTE — All these arrangements are used for fixed pitch type propellers.

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Amendments Issued Since Publication

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